CLAIMS:

1. A method for labeling a cell, the method comprising contacting the cell *ex vivo* with a fluorocarbon imaging reagent under conditions such that the fluorocarbon imaging reagent becomes associated with the cell.
2. The method of claim 1, wherein the fluorocarbon imaging reagent is a perfluoropolyether.
3. The method of claim 1, wherein the cell is contacted with the fluorocarbon imaging reagent in the presence of an uptake enhancing reagent.
4. The method of claim 3, wherein the uptake enhancing reagent comprises a cationic lipid.
5. The method of claim 1, wherein at least a portion of the fluorocarbon imaging reagent is internalized into the cell.
6. The method of claim 1, wherein at least a portion of the fluorocarbon imaging reagent is associated with the extracellular surface of the cell.
7. The method of claim 1, wherein the fluorocarbon imaging reagent is conjugated to a cellular targeting moiety.
8. The method of claim 7, wherein the cellular targeting moiety comprises an antibody that binds to an epitope that is exposed to the extracellular milieu.
9. The method of claim 1, wherein the fluorocarbon imaging reagent is conjugated to an internalization moiety.
10. The method of claim 1, wherein the cell is a mammalian cell.
11. The method of claim 1, wherein the cell is a cell of the immune system.
12. The method of claim 1, wherein the cell is a dendritic cell.
13. The method of claim 1, wherein the fluorocarbon imaging reagent is formulated as an emulsion.
14. The method of claim 1, wherein the emulsion comprises particles having a mean diameter of between 30 and 500 nm.

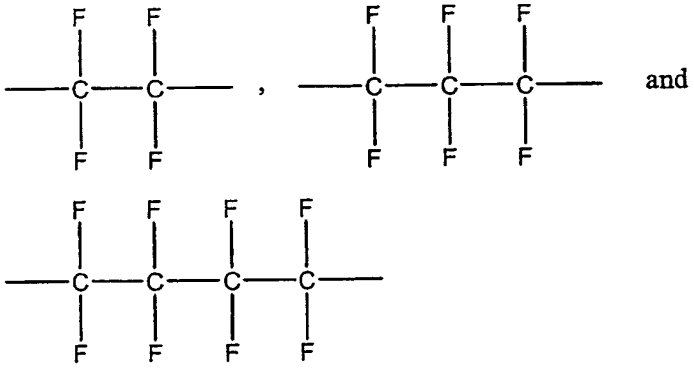
15. The method of claim 1, wherein the fluorocarbon imaging reagent is a perfluoro-crown ether.

16. The method of claim 15, wherein the imaging reagent is a perfluro-15-crown-5-ether.

17. The method of claim 1, wherein the fluorocarbon is a perfluorinated polyether having an average formula:

$XO(Y\text{-}O)_nZ$

wherein Y is selected from the group consisting of:



and

wherein n is an integer from 8 to 20; wherein X and Z are the same and are selected from the group consisting of perfluoroalkyls, perfluoroethers, fluoroalkyls terminated with fluoroacyl, carboxyl, amide or ester, methylols, acid chlorides, amides, amidines, acrylates and esters.

18. The method of claim 1, wherein the imaging reagent comprises an additional functional moiety.

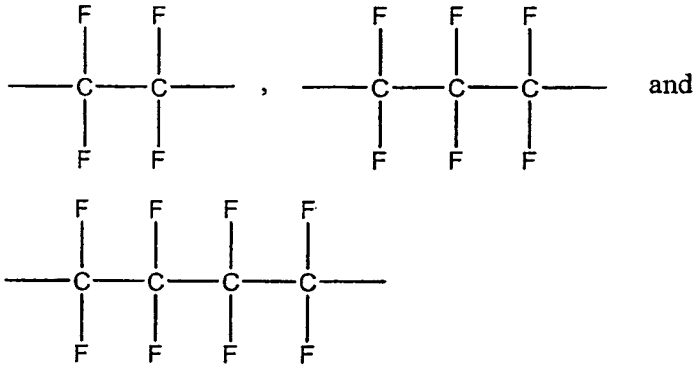
19. The method of claim 18, wherein the additional functional moiety is a detection moiety.

20. The method of claim 19, wherein the detection moiety is selected from the group consisting of: a fluorescent detection moiety and a PET detection moiety.

21. An imaging reagent having an average formula:

$XO(Y\text{-}O)_nZ$

wherein Y is selected from the group consisting of:



wherein n is an integer from 8 to 20; wherein X and Z are the same and are selected from the group consisting of perfluoroalkyls, perfluoroethers, fluoroalkyls terminated with fluoroacyl, carboxyl, amide or ester, methylols, acid chlorides, amides, amidines, acrylates and esters.

22. The imaging reagent of claim 21, wherein n=11.

23. The imaging reagent of claim 21, wherein X and Z are perfluoroethers terminated with a carboxyl group.

24. The imaging reagent of claim 21, wherein each carboxyl is derivatized with a polyethylene glycol.

25. The imaging reagent of claim 21, wherein X and Z are derivatized with a fluorescent detection moiety.

26. A linear fluorocarbon derivatized at one or more polymer ends with at least one functional moiety, wherein the at least one functional moiety is selected from the group consisting of: a detection moiety, a hydrophilic moiety, a targeting moiety and a cellular uptake moiety.

27. The linear fluorocarbon of claim 26, wherein the linear fluorocarbon is a linear perfluoropolyether.

28. The linear fluorocarbon of claim 26, wherein the at least one functional moiety is a detection moiety.

29. The linear fluorocarbon of claim 28, wherein the detection moiety is selected from the group consisting of: a fluorescent detection moiety and a PET detection moiety.

30. An emulsion comprising a perfluoropolyether and having a particle size ranging from 10 to 500 nm.

31. The emulsion of claim 30, wherein the emulsion is stable at temperatures ranging from 4°C to 37°C.

32. A method for detecting a cell in a subject, the method comprising:

a. administering to the subject a cell that is labeled with a fluorocarbon imaging reagent; and

b. examining at least a portion of the subject by a nuclear magnetic resonance technique, thereby detecting a labeled cell in the subject.

33. The method of claim 32, wherein examining by a nuclear magnetic resonance technique comprises collecting an ^{19}F data set.

34. The method of claim 33, further comprising collecting an ^{1}H data set.

35. The method of claim 34, further comprising generating and comparing a ^{19}F image and a ^{1}H image.

36. The method of claim 32, wherein the nuclear magnetic resonance technique is magnetic resonance imaging (MRI).

37. The method of claim 32, wherein the nuclear magnetic resonance technique is magnetic resonance spectroscopy (MRS).

38. The method of claim 32, wherein the fluorocarbon imaging reagent is a perfluoropolyether.

39. The method of claim 38, wherein the fluorocarbon imaging reagent is selected from the group consisting of: a linear perfluoropolyether, a cyclic perfluoropolyether and a mixture thereof.

40. The method of claim 32, wherein the cell is a mammalian cell.

41. The method of claim 32, wherein the cell is a cell of the immune system.

42. The method of claim 32, wherein the cell is a dendritic cell.

43. The method of claim 32, wherein the cell is administered to the subject as part of a cellular therapeutic regimen.

44. The method of claim 31, wherein the cell is a stem cell.

45. A labeled cellular formulation for administration to a subject, the formulation comprising:

a. a cell; and

b. a fluorocarbon imaging reagent that is associated with the cell.

46. The formulation of claim 45, further comprising a pharmaceutically acceptable excipient.

47. The formulation of claim 45, wherein the fluorocarbon imaging reagent is a perfluoropolyether.

48. The formulation of claim 45, wherein at least a portion of the fluorocarbon imaging reagent is internalized into the cell.

49. The formulation of claim 45, wherein at least a portion of the fluorocarbon imaging reagent is associated with the extracellular surface of the cell.

50. The formulation of claim 45, wherein the fluorocarbon imaging reagent is conjugated to a cellular targeting moiety.

51. The formulation of claim 50, wherein the cellular targeting moiety comprises an antibody that binds to an epitope that is exposed to the extracellular milieu.

52. The formulation of claim 45, wherein the fluorocarbon imaging reagent is conjugated to an internalization moiety.

53. The formulation of claim 45, wherein the cell is a mammalian cell.

54. The formulation of claim 45, wherein the cell is a cell of the immune system.

55. The formulation of claim 45, wherein the cell is a dendritic cell.

56. The formulation of claim 45, wherein the cell is prepared for use in a cellular therapeutic regimen.

57. A method for detecting transplanted cells in a transplant recipient, the method comprising:

a. administering cells for transplant to a transplant recipient, at least a portion of which cells for transplant are labeled with a fluorocarbon imaging reagent;

b. examining at least a portion of the subject by a nuclear magnetic resonance technique, thereby detecting the labeled cells.

58. The method of claim 57, wherein the location and optionally the trafficking of labeled cells is detected in the transplant recipient.

59. The method of claim 56, wherein the nuclear magnetic resonance technique is selected from the group consisting of: magnetic resonance imaging and magnetic resonance spectroscopy.

60. The method of claim 56, wherein the transplant recipient is a bone marrow transplant recipient.

61. The method of claim 56, wherein the cells for transplant comprise hematopoietic stem cells.

62. The method of claim 56, wherein the cells for transplant are derived from bone marrow, cord blood or peripheral blood.

63. The method of claim 56, wherein the transplant recipient is the recipient of a donor organ.

64. The method of claim 62, wherein at least a portion of the cells of the donor organ are labeled with a fluorocarbon imaging reagent.